

WHAT IS CLAIMED IS:

1. A light-emitting device comprising:
a multi-layer structure including one or more semiconductor layers, wherein an active layer of the multi-layer structure is configured to emit a first light radiation; and
5 a cap layer covering surface areas of the multi-layer structure while leaving exposed electrode areas defined on the multi-layer structure, wherein the cap layer includes a luminescent material compound capable of emitting at least one second light radiation when stimulated by the first light radiation.
- 10 2. The light-emitting device according to claim 1, a first area of the multi-layer structure encompasses the stack of a substrate, a first cladding layer, and a first ohmic contact layer, and a second area of the multi-layer structure encompasses the stack of the substrate, the first cladding layer, the active layer and a second ohmic contact layer.
- 15 3. The light-emitting device according to claim 2, wherein the substrate is made of a transparent insulating material including sapphire, SiC or the like.
4. The light-emitting device according to claim 2, wherein the first cladding
20 layer includes an n-type GaN layer.
5. The light-emitting device according to claim 1, wherein the active layer includes a multi-quantum well structure or a single well structure.

6. The light-emitting device according to claim 2, wherein the second cladding layer includes a p-type GaN layer.

7. The light-emitting device according to claim 2, wherein the first ohmic contact layer includes Ti/Al, Ti/Al/Ti/Au, Ti/Al/Pt/Au, Ti/Al/Ni/Au, Ti/Al/Pd/Au, Ti/Al/Cr/Au, Ti/Al/Co/Au, Cr/Al/Cr/Au, Cr/Al/Pt/Au, Cr/Al/Pd/Au, Cr/Al/Ti/Au, Cr/Al/Co/Au, Cr/Al/Ni/Au, Pd/Al/Ti/Au, Pd/Al/Pt/Au, Pd/Al/Ni/Au, Pd/Al/Pd/Au, Pd/Al/Cr/Au, Pd/Al/Co/Au, Nd/Al/Pt/Au, Nd/Al/Ti/Au, Nd/Al/Ni/Au, Nd/Al/Cr/Au, Nd/Al/Co/A, Hf/Al/Ti/Au, Hf/Al/Pt/Au, Hf/Al/Ni/Au, Hf/Al/Pd/Au, Hf/Al/Cr/Au, Hf/Al/Co/Au, Zr/Al/Ti/Au, Zr/Al/Pt/Au, Zr/Al/Ni/Au, Zr/Al/Pd/Au, Zr/Al/Cr/Au, Zr/Al/Co/Au, TiN_x/Ti/Au, TiN_x/Pt/Au, TiN_x/Ni/Au, TiN_x/Pd/Au, TiN_x/Cr/Au, TiN_x/Co/Au, TiWN_x/Ti/Au, TiWN_x/Pt/Au, TiWN_x/Ni/Au, TiWN_x/Pd/Au, TiWN_x/Cr/Au, TiWN_x/Co/Au, NiAl/Pt/Au, NiAl/Cr/Au, NiAl/Ni/Au, NiAl/Ti/Au, Ti/NiAl/Pt/Au, Ti/NiAl/Ti/Au, Ti/NiAl/Ni/Au, Ti/NiAl/Cr/Au or the like.

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8. The light-emitting device according to claim 2, wherein the second contact layer is made of a conductive metallic alloy including Ni/Au, Ni/Pt, Ni/Pd, Ni/Co, Pd/Au, Pt/Au, Ti/Au, Cr/Au, Sn/Au, Ta/Au, TiN, TiWN_x, WSi_x, or the like.

9. The light-emitting device according to claim 2, wherein the second ohmic contact layer is made of a transparent conductive oxide including, ITO, CTO, ZnO:Al, ZnGa₂O₄, SnO₂:Sb, Ga₂O₃:Sn, AgInO₂:Sn, In₂O₃:Zn, NiO, MnO, FeO, Fe₂O₃, CoO, CrO, Cr₂O₃, CrO₂, CuO, SnO, Ag₂O, CuAlO₂, SrCu₂O₂, LaMnO₃, PdO or the like.

10. The light-emitting device according to claim 1, wherein the cap layer is made of a material blend including a passivation material and a luminescent material compound.

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11. The light-emitting device according to claim 10, wherein the passivation material includes benzocyclobutene, spin-on glass or the like.

12. The light-emitting device according to claim 10, wherein the luminescent material compound includes a phosphor-based powder.

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13. The light-emitting device according to claim 1, wherein a plurality of connecting pads are respectively formed on the electrode areas of the multi-layer structure.

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14. The light-emitting device according to claim 13, wherein the connecting pads are made of a conductive metallic material.

15. A process of manufacturing a light-emitting device, comprising:
20 forming a multi-layer structure including an active layer configured to emit a first light radiation;
defining electrode areas on the multi-layer structure; and
forming a cap layer covering the multi-layer structure and leaving the electrode areas externally exposed, wherein the cap layer includes a luminescent material

compound capable of emitting at least one second light radiation when stimulated by the first light radiation.

16. The process according to claim 15, wherein forming a cap layer
5 comprises:
preparing a liquid mixture of a material blend including a passivation material
and a luminescent material compound;
laying the liquid mixture over the multi-layer structure;
solidifying the liquid mixture to form the cap layer; and
10 patterning the cap layer to expose the electrode areas of the multi-layer structure.

17. The process according to claim 16, wherein laying the liquid mixture
over the multi-layer structure includes spin-coating the liquid mixture over the
multi-layer structure.

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18. The process according to claim 16, wherein the passivation material
includes benzocyclobutene, spin-on-glass or the like.

19. The process according to claim 16, wherein the luminescent material
20 compound includes a phosphor-based powder.

20. The process according to claim 16, wherein solidifying the liquid
mixture includes performing at least one baking process.

21. The process according to claim 15, further comprising forming
connecting pads on the electrode areas of the multi-layer structure.

22. The process according to claim 21, wherein the connecting pads are
5 made of a conductive metallic material.

23. The process according to claim 15, wherein forming a multi-layer
structure including an active layer configured to emit a first light radiation further
comprises:

10 forming stack of layers including a substrate, a first cladding layer, an active
layer and a second cladding layer;

patterning the stack layers to expose an area of the first cladding layer; and

forming first and second ohmic contact layers on the first and second cladding
layers, respectively.

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